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PROGRESS REPORT NO.23

TRAVELING-WAVE TUBES

Index No. 111613, Task 9  
Contract N0bsr-57354  
April 1954

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PROGRESS REPORT NO. 23

TRAVELING-WAVE TUBES

Driver Tube

During the past interval Driver Tubes Nos. 115 and 117 were tested. Former results with Tube No. 115 were confirmed. Peak output powers of 2 kilowatts were obtained, although only in the presence of oscillation. The tube operated stably at 1 kilowatt of output power. During testing of this tube the loss was burned up due to excessive drive power. Further tests were, therefore, not possible. Tube No. 117 was modified by changing the former method of helix support (ceramic rods) to a smooth-bore quartz cylinder. R-f tests on this tube indicated that the quartz support cylinder produced severe dielectric loading, and the output power from this tube was limited to approximately 250 watts peak. The electron gun used in Tube No. 117 was constructed with the use of new fixtures. Tests of the beam transmission indicated that a great improvement over the former tubes had resulted. Approximately 100 per cent beam transmission was measured. This tube now is being life tested.

Although the beam transmission of the present electron gun is satisfactory, a modification has been initiated. The change involves scaling the gun to a larger size. Several advantages over the present gun are gained in this process, namely, less cathode loading and a reduction of magnetic-field power by a factor of two. In addition, a simplification of the construction results from less critical design tolerances.

Tube No. 118 is now under construction. A modification in the TPI of the helix to account for the dielectric loading introduced by the quartz support cylinder has been included in this tube.

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Output Tube

The second Pierce-type electron gun (ungridded anode type) was completed during the past interval. Tests on this tube proved satisfactory. Operation at the higher design voltage of 80,000 volts was not possible with the present modulator and pulse transformer. A second delay line and pulse transformer which will provide operation at 80,000 volts and 35 amperes has been ordered.

During the past interval a study was made to determine the magnitude of the dielectric loading on the slotted structures previously reported upon as a function of support methods employed. Results indicate that the dielectric loading was severe. A reduction in dielectric loading was obtained by going from a glass cylinder support to a quartz three-rod support. Further improvements in the method of support for these slotted structures should permit their use with the high-perveance gun at a 70,000- to 80,000-volt level. As a result of these tests several new structures are being fabricated.

Concurrently, the high-power output tube is in the final stages of design, and the necessary solenoid parts have been ordered.

Program for the Next Interval

The final design changes for the output tube, including the solenoid, will be completed. Parts for the construction of the first model of the output tube will be ordered. Driver Tube No. 109 will be completed and tested during the next interval.

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